

D1
end

lens element whose surface is aspherical, and said refraction type optical system includes at least one lens element whose surface is aspherical.

D2
12
29. (Twice amended) A catadioptric optical system comprising:

a catadioptric type optical system, which includes a lens element, a first reflecting surface and a second reflecting surface that reflects light coming from said first reflecting surface, light coming from said second reflecting surface passing said first reflecting surface off-axis thereof, at least one of said first and second reflecting surfaces being a concave reflecting surface, for forming an intermediate image from an object of a first plane surface; and

a refraction type optical system for forming a final image of light coming from said object after twice reflected by said first and second reflecting surfaces and directly from said second reflecting surface, onto a second plane surface which is substantially parallel to said first plane surface,

D2
and
D3

wherein, said catadioptric type optical system and said refraction type optical system are disposed between said first plane surface and said second plane surface.

D4

36. (Twice amended) A catadioptric optical system comprising:

a catadioptric type optical system, which includes a lens element, a first reflecting surface and a second reflecting surface that reflects light coming from said first reflecting surface, light coming from said second reflecting surface passing said first reflecting surface off-axis thereof, at least one of said first and second reflecting surfaces being a concave reflecting surface, for forming an intermediate image from an object of a first plane surface; and

a refraction type optical system for forming a second image onto a second plane surface which is substantially parallel to said first plane surface,

wherein, said catadioptric type optical system and said refraction type optical system are disposed between said first plane surface and said second plane surface, and wherein said catadioptric type optical system includes a lens group including at least one lens element whose

D3
end

surface is aspherical, and said refraction type optical system includes at least one lens element whose surface is aspherical.

D4
28
46. (Twice amended) A method of manufacturing a catadioptric optical system comprising:

providing a catadioptric type optical system, which includes a lens element, a first reflecting surface and a second reflecting surface that reflects light coming from said first reflecting surface, light coming from said second reflecting surface passing said first reflecting surface off-axis thereof, at least one of said first and second reflecting surfaces being a concave reflecting surface, for forming an intermediate image from an object of a first plane surface; and

providing a refraction type optical system for forming a second image onto a second plane surface which is substantially parallel to said first plane surface, wherein, said catadioptric type optical system and said refraction type optical system are disposed between said first plane surface and said second plane surface, and wherein said catadioptric type optical system includes a lens group including at least one lens element whose

surface is aspherical, and said refraction type optical system includes at least one lens element whose surface is aspherical.

Dy
fm
29
47. (Twice amended) A method of manufacturing a catadioptric optical system comprising:

providing a catadioptric type optical system, which includes a lens element, a first reflecting surface and a second reflecting surface that reflects light coming from said first reflecting surface, light coming from said second reflecting surface passing said first reflecting surface off-axis thereof, at least one of said first and second reflecting surfaces being a concave reflecting surface, for forming an intermediate image from an object of a first plane surface; and

providing a refraction type optical system for forming a second image onto a second plane surface which is substantially parallel to said first plane surface, wherein, said catadioptric type optical system and said refraction type optical system are disposed between said first plane surface and said second plane surface, and

wherein at least one of said first and second reflecting surfaces is a concave reflecting surface that corrects positive Petzval sum created by said lens element.

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48. (Amended) A method of manufacturing a catadioptric optical system comprising:

providing a catadioptric type optical system, which includes a lens element, a first reflecting surface and a second reflecting surface that reflects light coming from said first reflecting surface, light coming from said second reflecting surface passing said first reflecting surface off-axis thereof, at least one of said first and second reflecting surfaces being a concave reflecting surface, for forming an intermediate image from an object of a first plane surface; and

providing a refraction type optical system for forming a second image onto a second plane surface which is substantially parallel to said first plane surface, wherein, said catadioptric type optical system and said refraction type optical system are disposed between said first plane surface and said second plane surface, and wherein the catadioptric optical system has both-sides telecentricity.